MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

DET5078 – ANALOG ELECTRONICS 2

(Diploma in Electronic Engineering)

6 MARCH 2019
2.30 PM – 4.30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages, excluding cover page, with 4 questions only.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

(i) Explain five similarities and five differences between JFET and MOSFET.
(ii) Why FET is known as Field Effect Transistor?
(iii) Figure Q1(iii) shows the transfer characteristics of a particular JFET. Determine the following;
(a) Type of JFET
(b) Maximum drain current
(c) The gate-source voltage for which drain current reduces to 6 mA
(d) Maximum transconductance
(e) Transconductance value at V_{GS}=-2 V.

[5+2+1+1+4+1.5+2.5 Marks]

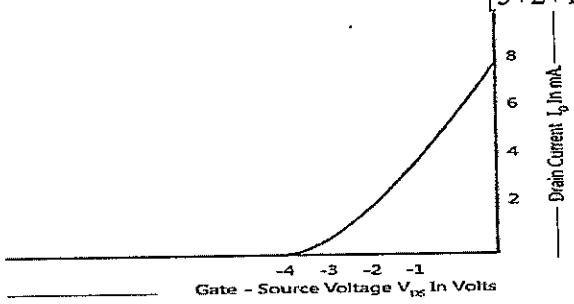

Figure Q1(iii)

(iv) For the circuit as shown in Figure Q1[B] (iv), determine following;
(a)Type of biasing
(b)Gate voltage
(c)Drain current if V_{GS}=-2 V
(d)V_{DS}

[1+2+3+2 Marks]

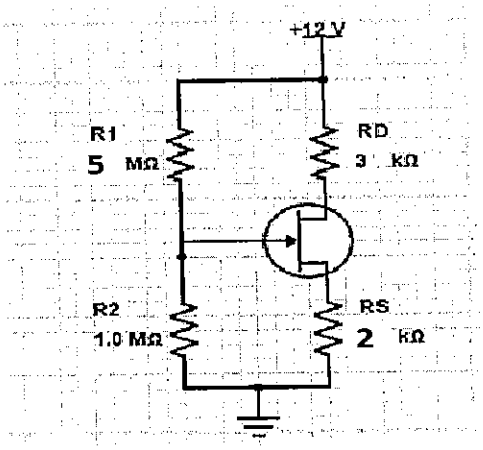

Figure Q1[B](iv)

Continued ...

Question 2

(i) Design the JFET amplifier circuit as shown in Figure Q 2(i) for the given parameters; I_{DSS} = 10 mA, $V_{GS(off)}$ = -4 V, r_d = 50 kΩ and A_V = -10

[5 Marks]

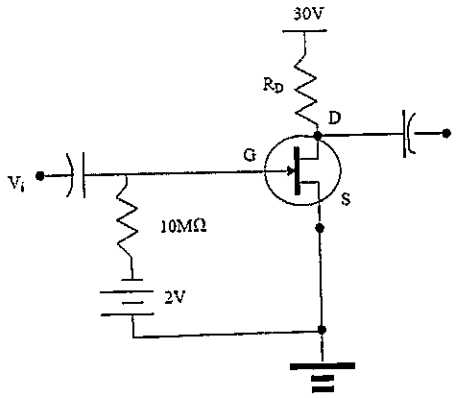

Figure Q2(i)

(ii) For the JFET amplifier circuit as shown in Figure Q2(ii), given R_G = 1MΩ, R_S = 1.2 KΩ, R_D=200 kΩ, R_L=4.7 kΩ and operates up to 30 kHz. The coupling and bypass capacitors have large values of capacitance. The FET parameters are g_m = 4 mA/V, r_d = 100 kΩ, C_{gs} = 6 pF, C_{ds} = 1 pF, C_{gd} = 4 pF. Draw

(a)The low frequency circuit model

(b)The high frequency circuit model.

Calculate;

(c)The gain of the amplifier

(d)Input impedance

(e)Output impedance.

[4+4+6+3+3 Marks]

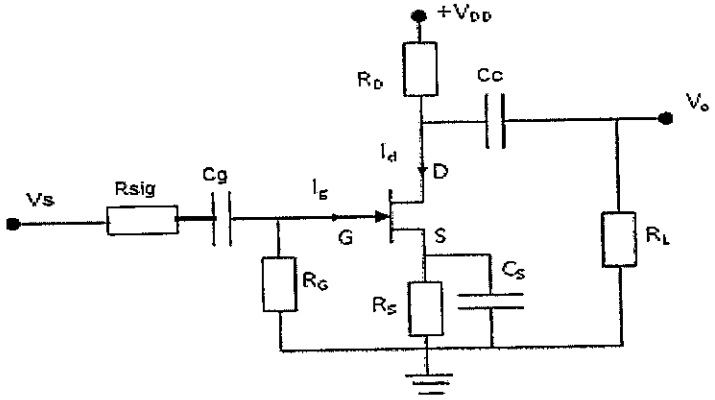

Figure Q2(ii)

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Question 3

(i) Identify the class of power amplifier with proper explanation based on Figure Q3(i)(a) and Figure Q3(i)(b).

[1.5+1.5 Marks]

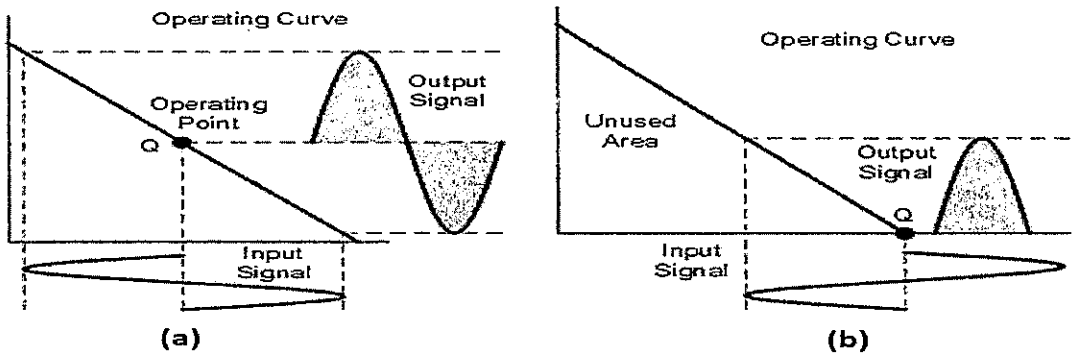

Figure Q3(i)

(ii) Give two advantages and two disadvantages of each power amplifier class as shown in Figure Q3(i)(a) and Q3(i)(b).

[4+4 Marks]

(iii) Calculate the maximum ac output power in the amplifier circuit as shown in Figure Q3 (ii). [Assume V_{BE}=0 V]

[9 Marks]

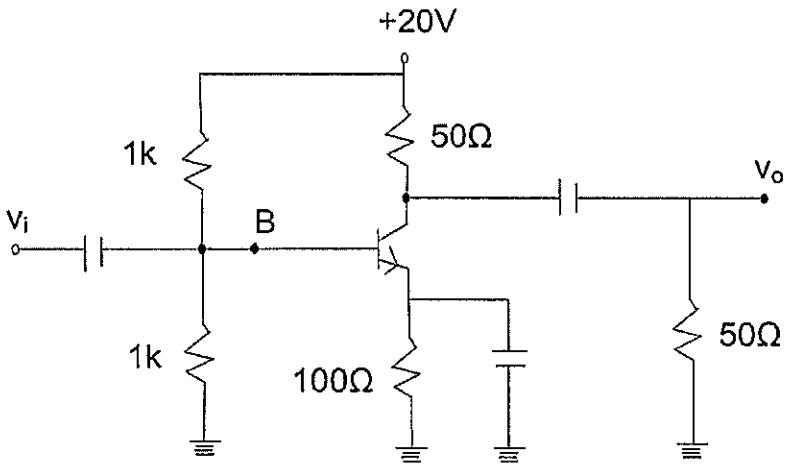

Figure Q3(ii)

(iv) A transistor supplies 2 W for a 5 kΩ load. The zero-signal dc collector current is 35 mA and it rises to 40 mA when the signal is applied. Determine the percentage of second-harmonic distortion.

[5 Marks]

Continued ...

Question 4

(i) Design the Schmitt trigger circuit as shown in Figure Q4(i). Given: Hysteresis voltage is 8 V.

[4 marks]

(ii) Determine the upper (UTP) and lower (LTP) trigger voltages of this circuit

[3 marks]

(iii) Draw the Hysteresis curve of the circuit. [4 marks]

Assume op-amp is ideal.

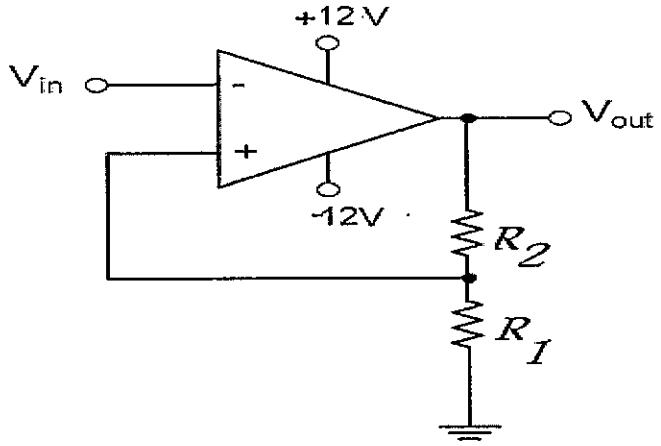

Figure Q4(i)

(iv)The free running multivibrator as shown in Figure Q 4(iv) has the following parameters; V_{CC}=15 V, R_A=10 kΩ, R_B=22 kΩ, C=0.001 μF. Calculate the following;

(a)The operating frequency

(b)Duty Cycle

(c)Pulse width

[3+3+2 Marks]

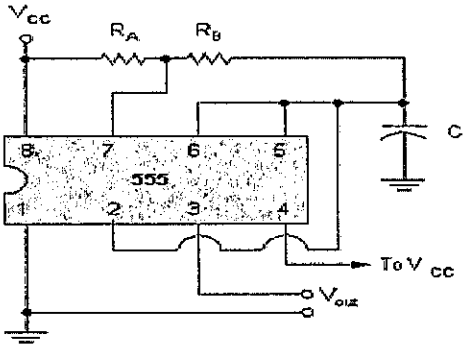

Figure Q4(iv)

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Question 4

(v) Draw the output waveform for the given input signal as shown in Figure Q4(v) for the three different types of multivibrator circuit.

[2+2+2 Marks]

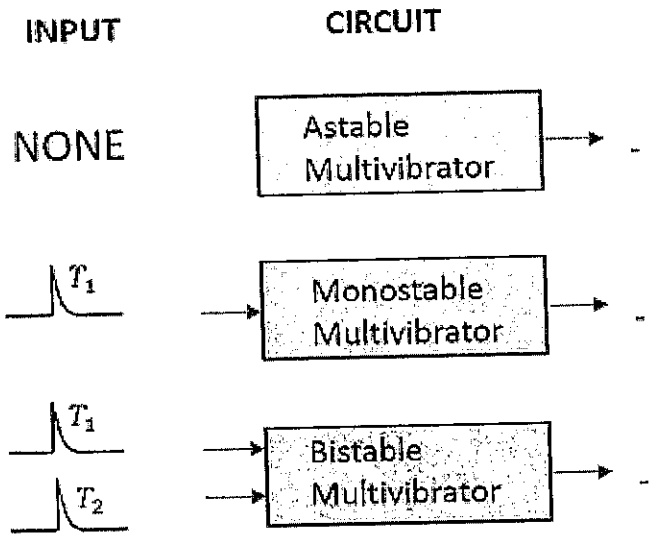

Figure Q4(v)

Useful formulas:

$$A_V = \frac{-g_m + Y_{gd}}{Y_{gd} + g_d + Y_{ds} + G_D + G_L}$$

$$Y_i = G_G + Y_{gs} + Y_{gd}(1 - A_V)$$

$$Y_o = G_D + Y_{ds} + g_d + Y_{gd}$$

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